PATENT
0825-0176P

IN THE U.S. PATENT AND TRADEMARK OFFICE

APPLICANT:	CROZIER, Herve	CONF:	3623
SERIAL NO.:	09/530,803	GROUP:	1713
FILED:	June 12, 2000	EXAMINER:	LEE, Rip

FOR: COLOURED POLYPROPYLENE COMPOSITIONS

DECLARATION SUBMITTED UNDER 37 C.F.R. § 1.132

Honorable Commissioner
Of Patents and Trademarks
P.O. Box 1450
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August 16, 2006

Sir:

I, Mr. Bala Kona of the Skill center, Business Unit Moulding, Borealis, Norway, do hereby declare the following:

I have been awarded an MSc degree in Polymer Science from Freie University of Berlin, in 2004. I have my Bachelor's degree in Chemical engineering from India.

I am a Product developer by position and have an experience of 1.2 years.

I am familiar with the above referenced patent application, as well as the development, usages and properties of polymer compounds.

I have read and understand the subject matter of the Office Action of May 17, 2006.

The following comments are offered in support of the patentability of the instant invention.

To begin, the Examiner has indicated that Delta Max cannot be generalized. For the present case, this is not correct. While it is true that shrinkage can depend to some extent on the color of the pigment (that is, the wavelength emitted by the pigment) the colors in Table 1 of the application cover the whole range of spectrum of visible light (white – red – blue). Moreover, the pigments for the different colors that define the visible spectrum represent the highest shrinkage within pigments for each color. This provides a "shrinkage range" for conventionally used pigments. As a result, other conventional pigments within this visible spectrum would give comparable or even lower shrinkage than the pigments tested. Consequently, the Delta Max is clearly defined and can be generalized for any pigment in that the pigment's Delta Max will fall within the range defined in the application.

I note that there is a typographical error in Table 1 that incorrectly lists the cross direction Delta Max value for talc-nucleated homo PP as 0.41. Delta Max is the difference in shrinkage values between "natural" talc-nucleated PP and pigmented tac-nucleated PP, so this value should be 0.42.

According to the Examiner, the invention described in Application Number 09/530,803 is obvious. I disagree.

Table 1a below shows the shrinkage effect of un-pigmented PP which is nucleated with a master-batch (1) in a similar way as disclosed and exemplified in Shiga et al. and (2) which is nucleated according to the present invention (i.e. in-situ during polymerization using the modified catalyst). While there is no significant difference in shrinkage between the tested materials in the flow direction, a <u>marked difference</u> in shrinkage is present in the **<u>cross</u>** direction. Here, the test shows that when a non-

nucleated PP material is nucleated even with a small amount of master-batch, a clear increase in shrinkage is seen (compare Reference Ex.1 with Comparative Ex. 2). This increase, however, is not proportional to the shrinkage behavior, which increases to a much lesser extent with increasing master-batch amounts (compare Comparative Ex. 2 with Comparative Ex.3). It is notable that the mechanical blending used by Shiga et al. limits the amount of master-batch (which is not described as a base resin) that can be added to 50 wt%, due to homogeneity and phase change.

This leads to the conclusion that a higher level of shrinkage results from the nucleated homo PP of the invention, denoted in Table 1a as "Ex. 4 of the invention" and equating to "homopolymer of Example 2" described in the application. One can therefore state that the in-situ nucleation used in the present invention has a greater effect on shrinkage than does the master-batch nucleation used by Shiga et al. As a consequence, **the present invention surprisingly more effectively overcomes the influence of pigments on shrinkage than does the master-batch nucleation used by Shiga et al.**

Table 1a

Shrinkage test was carried out in each test by molding a box in same conditions and using same amount of material.	**Shrinkage, %**	**Flow direction**	**Cross direction**
Reference Ex. 1	Non-nucleated homo PP	1.58	1.51

Comparative Ex. 2	Non-nucleated homo PP +2% master-batch of nucleated homo PP	1.59	1.61
Comparative Ex. 3	Non-nucleated homo PP +5% master-batch of nucleated homo PP	1.59	1.68
Ex.4 of Invention	Nucleated homo PP of the invention	1.60	1.71

As further support of the difference between the master-batch nucleated PP material of Shiga et al., as represented by PP material nucleated using master-batch blending, and the "in-situ" nucleated PP of the present invention, the difference in crystallization temperature (Tcr) between these materials was explored.

I first note that Shiga et al. do not provide the PP properties of the base PP and the nucleated master-batch, nor the Tcr of the master-batch (1). It seems however that the Tcr of the nucleated master-batch (1) of Example 1 of Shiga et al. is clearly more than 127°C. Consequently, in order to perform a <u>valid</u> comparison, the side-by-side experiment conducted and reported in Table 2a used the nucleated homo PP of Example 2 from the application as the nucleated master-batch PP material for the comparative examples, Ex. 5-7. I also note that the Tcr of the nucleated homo PP of Example 2 from the application (referred to as Ex. 8 in Table 2a) represents the lower limit possible for PP as nucleated in Example 1 of Shiga and can be higher depending on the other properties of the PP such as the density and/or isotacticity. These results are presented in Table 2a.

Table 2a

		Reference Ex.4	Comparative Ex. 5	Comparative Ex. 6	Comparative Ex. 7	Ex. 8 of Invention
		Non-nucleated homo PP	Non-nucleated homo PP + 1% masterbatch of nucleated homo PP	Non-nucleated homo PP + 2% masterbatch of nucleated homo PP	Non-nucleated homo PP + 5% masterbatch of nucleated homo PP	nucleated homo PP
Tcr of PP	*°C*	111,7	121,2	122,1	123,1	126,8
Tm of PP	°C	163,6	165,5	164,6	164,1	
dH of PP	J/g	77	82,5	81,2	81,8	
dH of PE	J/g	117	117	117	117	
Tensile Modulus, 7d	*MPa*	1130	1250	1290	1350	
Charpy impact, RT	*kJ/m2*	62	72,6	73	83,9	
Charpy impact,0°C	*kJ/m2*	15,7	12,2	15,6	19,2	
Charpy impact,-20° C	kJ/m2	7,6	8,6	8,7	9,7	

Here, it is apparent that the 126.8°C Tcr of the nucleated homo PP of Ex. 8 of the invention, equating to "homopolymer of Example 2" described in the application, is markedly higher compared to master-batch nucleated comparative examples Ex. 5, 6 and 7 (121.2°C, 122.1°C and 123.1°C, respectively).

Similar to the shrinkage experiments summarized in Table 1a, an addition of a nucleating agent into a non-nucleated PP of reference Ex.4, even in small amounts, causes significant increases in Tcr. And like the shrinkage results, the Tcr increase is <u>not</u> proportional to the increase in the amount of master-batch added, but only gradually reaches a certain Tcr level which depends on the Tcr of the base PP used and the master-batch of nucleated homo PP. In this experiment the nucleated master-batch has a Tcr equivalent to the Tcr of the nucleated homo PP of the present invention. This allows us to conclude that the nucleated homo PP of the invention is <u>always higher</u> than the Tcr of the blends made using the masterbatch of nucleated homo PP.

It is well known that the higher the Tcr, the faster the crystallization. Thus, the conclusion drawn from the results summarized in Table 2a is that the nucleated PP of the invention crystallized quicker than the PP nucleated with the master-batch.

According to the present invention, fast crystallization can be used for controlling the nucleation effect of different pigments and thus the nucleation of the overall molding process, which makes changes of pigments more feasible. While it was also known that pigments also increase the Tcr of a PP material, the data presented on page 17 of the present application shows that the increase is typically <u>lower than</u> that achievable with the nucleated PP of the invention. Here, the Tcr of the non-nucleated PP changes from 115.8°C to 115.7°C for white pigment, 119.5°C for red pigment and 129.3°C for blue

pigment. Yet the nucleated PP of the homopolymer of Example 2 described in the application (i.e. Ex. 8 in Table 2a) has a Tcr of 126.8°C.

Thus, the nucleated PP of the invention has a higher nucleation density and its nucleation effect is higher than that of the pigments, which allows it to "overrule" or control the effect of pigment on crystallization (and thereby the pigment nucleation effect). Also in the case of blue pigmented PP with a high Tcr, the controlling effect of the nucleated PP homopolymer of Example 2 described in the application was much pronounced compared to the talc-nucleation or no nucleation examples.

To summarize, in view of the information presented in Table 2a and the application itself, **the surprising conclusion must be that due to the higher Tcr, the nucleated PP of the invention has a better controlling effect on pigment crystallization than does PP material nucleated with a master-batch**.

For these reasons the present invention provides surprisingly improved results over the Shiga et al. invention and cannot be considered obvious.

The undersigned hereby declares that all statements made herein based upon knowledge are true, and that all statements made based upon information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

DATED:21.08.06

K. Balakantaiah

Mr. Bala Kona